**ABSTRACT**

The purpose of the current study was to compare physiological, musculoskeletal, and biomechanical characteristics between SEAL Operators and SEAL Qualification Students (SQT). The operational demands placed on the Operators during training and deployment may result in musculoskeletal injuries and physical readiness decrements across the tactical life cycle. Extending the tactical life cycle of the Operators is critical for tactical readiness. Specific human performance programs are needed to promote physical readiness and mitigate musculoskeletal injuries.

**INTRODUCTION**

- The operational demands placed on the Operators during training and deployment may result in musculoskeletal injuries and physical readiness decrements across the tactical life cycle.
- Extending the tactical life cycle of the Operators is critical for tactical readiness.
- Specific human performance programs are needed to promote physical readiness and mitigate musculoskeletal injuries.
- The purpose of the current study was to compare physiological, musculoskeletal, and biomechanical characteristics between cohorts of SEAL Operators and Qualification Students (SQT).

**SUBJECTS**

<table>
<thead>
<tr>
<th>REAL Operators</th>
<th>SQT Students</th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td>255</td>
</tr>
<tr>
<td>Age (years)</td>
<td>26.5 ± 5.9</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>178 ± 5.6</td>
</tr>
<tr>
<td>Mass (kg)</td>
<td>85.6 ± 8.5</td>
</tr>
</tbody>
</table>

**PROCEDURES**

**Body Composition**
- Body composition was measured using air displacement plethysmography (BodPod, Cosmed, Chicago, IL).

**Anaerobic Power/Capacity**
- Anaerobic power and capacity were assessed with a 30s Wingate cycle protocol using an electronically braked cycle ergometer (VeloTron, Rainforest, Inc, Seattle, WA).
- Aerobic capacity and lactate threshold were calculated from an incremental treadmill protocol using a metabolic cart (Parvo Medics, Sandy, UT) and a portable lactate analyzer (Lactate Pro, Arkray, Inc, Kyoto, Japan).

**Strength**
- Isokinetic knee flexion/extension, shoulder internal/external rotation, and torso rotation strength (1 repetition maximum, percent body weight).
- Shoulder flexion/extension, internal/external rotation (degrees).
- Hamstring flexibility (degrees).

**Balance and Landing Mechanics**
- Landing and balance were measured during a single leg landing task (Dynamic Postural Stability Index).

**SUMMARY AND CONCLUSIONS**

- These findings suggest the need to focus on human performance training in SOF to limit physical readiness loss and prevent musculoskeletal injuries.
- Future research should incorporate longitudinal testing and injury surveillance to assess force-wide decrement that occurs over the course of the tactical life cycle.

**RESULTS**

- Significant differences between Operators and Students were found in the following measures (p < 0.05):
  - Aerobic capacity (%VO2): Operators = 80.5 ± 5.5, Students = 73.5 ± 8.9
  - Shoulder Internal Rotation Flexibility (°): Operators = 55.2 ± 8.2°, Students = 50.1 ± 6.7°
  - Shoulder Posterior Capsular Tightness (°): Operators = 51.0 ± 6.7°, Students = 55.2 ± 6.2°
  - Hip Flexor Flexibility (°): Operators = 97.9 ± 4.3°, Students = 111.0 ± 7.7°
  - Knee Flexion Strength (%BW): Operators = 136.0 ± 23.8%, Students = 144.9 ± 23.9%
  - Torso Extension Strength (%BW): Operators = 337.7 ± 82.6%, Students = 400.0 ± 132.4%
  - Torso Rotation Strength (%BW): Operators = 175.9 ± 31.7%, Students = 188.9 ± 32.7%
  - Vertical Ground Reaction Forces (%BW): Operators = 545.4 ± 46.0%, Students = 566.3 ± 107.5%

- The results demonstrate several areas of physical and physiological differences between SQT Students and experienced Operators that may be related to the demands of training and multiple deployment cycles.
- These findings suggest the need to focus on human performance training in SOF to limit physical readiness loss and prevent musculoskeletal injuries.
- Future research should incorporate longitudinal testing and injury surveillance to assess force-wide decrement that occurs over the course of the tactical life cycle.